BOOK REVIEWS

ELEMENTARY PARTICLES—by David H. Frisch and Alan M Thorndike. Publisher—D. Van Nostrand Company, Inc , Princeton, New Jersey

The book is nice description of some of the basic experiments on elementary particles which are the nut-bolts in the structure of theories of elementary particles. The reader of the book need not have extensive familiarity with mathematical physics The authors however have stressed on the rapidly changing state of knowledge in this field The book may be used as a rapid reader

T Roy

BOUNDARY AND EIGEN VALUE PROBLEMS IN MATHEMATICAL PHYSICS—by Hans Sagan Publisher—John Wiley and Sons, Inc, New York, London.

The book does not indulge much on the Technicalities but rather on the general principles by inductive methods The book emphasises more on the problems. Though instructive, it seems as a text book it only fulfils a partial requirement It is amusing to see that in Chapter VIII Article 1.2 the author has tried to deduce Schrodinger Equation and his Equation (VIII 18) is not correct though (VIII 20) is Barring one or two such personal fancies the book is really a good one

T Roy

THE PROPAGATION OF ELECTROMAGNETIC WAVES IN PLASMAS- -by V L Ginzburg, Translated by J B Sykes and R J Tayler Pergamon Press, 1964 Pp. xix +535. Price £ 7 net.

The theoretical study of the interaction of a plasma and an electromagnetic wave has turned out to be a common factor in many a scientific discipline, namely, ionospheric physics, astrophysics, radio astronomy and physics of laboratory plasmas. Barring a few topics, mentioned in the Preface, the study, in almost all its essential details, is admirably presented by the Soviet author in a single volume The major topics omitted relate to plasmas with statistical inhomogeneities or with boundary walls and to plasmas in non-equilibrium conditions

Four distinct types of plasmas are considered in the book –(i) homogeneous isotropic plasma, (ii) homogeneous magnetoactive plasma, (iii) inhomogeneous isotropic plasma and (iv) inhomogeneous magnetoactive plasma A special emphasis is then laid on the two topics (a) reflection of radio waves from ionospheric layers, and (b) radio wave propagation in cosmic conditions. Finally, the important aspect of the non-linear phenomena in a plasma is considered

Regarding the theory of wave propagation in plasmas, both the macroscopic and microscopic approaches are dealt with elegantly. The so-called elementary theory and the kinetic theory as well as the hydromagnetic and quasihydrodynamic approximations are presented to deduce plasma properties, such as permittivity,

conductivity, indices of refraction and absorption, etc Methods for solving wave equations for a plasma are described, and the reflection, penetration, absorption and transmission of electromagnetic waves as well as the change in their polarisation are discussed (One important omission here pertains to the numerical method of solution on a digital computer) Waves of various kinds —electromagnetic, plasma, hydromagnetic and acoustic—are considered. The special feature in the propagation of pulse signals is explained Of particular significance are the discussions on spatial dispersion, supplemented by Appendix A, and on energy density and conservation of energy in a dispersive medium, supported by Appendixes B and C

The problem of the reflection of radio waves by an inhomogenous layer is discussed in detail mainly from the viewpoint of its applications to the ionosphere The chapter on cosmic conditions concerns, on the one hand, the ionized atmosphere of the sun, our nearest star, and, on the other, the interstellar medium with particular reference to the absorption of waves owing to motion of electrons in the Coulomb field of a point charge In the last chapter the author explains nonlinear phenomena in a plasma in terms of its parameters and describes such nonlinear effects as self-interaction, cross-modulation, generation of combination frequencies, etc

It is worth noting that the author, all throughout the volume, has taken the definite stand of rejecting the Lorentz polarisation term in calculating the effective electric field in a plasma. Although there seems to be stronger evidence against the inclusion of the term than in favour, the issue, according to quite a few, is not yet conclusively settled.

A weak point of the book is its scanty reference to two topics of current interest the first relating to diagnostics of laboratory plasmas, particularly in controlled thermonuclear experiments, and the second to communication through plasmas surrounding space vehicles during their re-entry into the earth's atmosphere

The book has, to its credit, a long list of references, but a few well-known names like those of W. H Eccles and J. Larmor, H. Margenau and W. P Allis, are, unfortunately, found missing. In addition to the subject index following the list, an author index would have been much welcome

Nevertheless, the book is really remarkable for the fact that, while it may be regarded as an elaborate work of reference for the research specialist, the expositions of basic phenomena are clear enough to help and satisfy the beginner

Sykes and Rayler are to be congratulated for their commendable translation of the Russian text The book incorporates a great deal of results obtained by Soviet physicists, and the English edition is particularly valuable for making the results known to a large number of interested persons who had so long little acquaintance with the work carried out in the USSR.

J. Basu